

REMARKS

Claims 1-3 are pending in the application. In the Office Action of January 9, 2002, the Examiner made the following rejections:

- A.) Rejected claims 1-3 under 35 U.S.C. §112, second paragraph.
- B.) Rejected claims 1-2 under 35 U.S.C. §103(a) as being unpatentable over *Higashide* in view of *Lin*.
- C.) Rejected claim 3 under 35 U.S.C. §103(a) as being unpatentable over *Higashide* and *Lin* and further in view of *Haga et al*.

Applicant respectfully traverses the rejections. Applicant addresses the Examiner's disposition as follows:

A.) Rejection of claims 1-3 under 35 U.S.C. §112, second paragraph:

Claims 1 and 3 have been amended as per the Examiner's request to overcome the rejection. Specifically, in claims 1 and 3, "frequency" has been replaced with --wavelength--.

The specification has also been amended to replace each occurrence of "frequency" with --wavelength--. Applicant respectfully submits that there was an error during translation from the Japanese priority application, and that the correct term is "wavelength". Applicant respectfully notes that the Japanese priority application has been incorporated by reference into the present application. Accordingly, no new matter is added by the current amendment.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

Claim 2 depends directly from claim 1 and is therefore allowable for at least the same reasons that claim 1 is allowable.

Applicants respectfully submit the rejection has been overcome and request that it be withdrawn.

B.) Rejection of claims 1-2 under 35 U.S.C. §103(a) as being unpatentable over *Higashide* in view of *Lin*:

Applicant respectfully disagrees with the rejection.

Applicant's independent claim 1 claims a solid-state imaging device that has an output portion connected to an output end of a horizontal transfer register. The output portion has a gate structure including an oxide film and a nitride film. The solid-state imaging device also has

upper layer films allowing ultraviolet rays having a wavelength of 400 nm or less to pass therethrough, and a metal made shield film formed in such a manner as to cover a region of the gate structure of the output portion.

Thus, as described in the specification, Applicant's metal made shield film prevents ultraviolet rays from entering the gate structure in the output portion. This prevents a shift of the threshold voltage of the gate structure due to the ultraviolet rays, and thus prevents the deterioration of the solid-state imaging device.

This is clearly unlike *Higashide* in view of *Lin*. *Higashide* discloses gate electrodes 50, where a portion of the gate electrodes 50 is covered by a metal film 53 and a portion is not covered by the metal film (see portion of gate electrodes 14, 15 not covered by metal film 41 in Fig.2B). Unlike Applicant's gate structure that is located in an output portion, *Higashide's* covered gate-electrode-portions are located in a light receiving portion. Each of *Higashide's* gates are next to a photodiode 11 in a matrix of photodiodes (*i.e.*, within an imaging portion). *Higashide's* metal film 53 provides a frame of an aperture so that incoming light can be concentrated on a photodiode 11. A portion of the gate electrodes 50 merely happens to reside under this metal film frame 53. Thus, unlike Applicant's claimed gate structure, nowhere does *Higashide* disclose or suggest a gate structure that is located in an output portion where it is covered by a metal shield film.

Accordingly, unlike Applicant's claim 1, *Higashide* could not teach preventing reduction in threshold voltage at an output portion by providing a metal shield film over a gate structure located in the output portion.

Lin also fails to disclose or suggest a gate structure that is located in an output portion where it is covered by a metal shield film.

Therefore, *Higashide* in view of *Lin* fails to disclose or suggest Applicant's claim 1.

Claim 2 depends from claim 1 and is therefore allowable for at least the same reasons that claim 1 is allowable. Also, neither *Higashide* nor *Lin*, taken singly or in combination, disclose or suggest a metal shield that has an opening over a floating point diffusion region. The Examiner argues that *Higashide* discloses this feature in Fig. 5A, where *Higashide's* metal film 53 has an opening. However, unlike Applicant's claim 2, *Higashide's* opening is located over a photodiode 53, not a floating point diffusion region. Thus, for this reason also, *Higashide* in view of *Lin* fails to disclose or suggest Applicant's claim 2.

Applicant respectfully submits that the rejection of claims 1 and 2 has been overcome and requests that it be withdrawn.

C.) Rejection of claim 3 under 35 U.S.C. §103(a) as being unpatentable over *Higashide* and *Lin* and further in view of *Haga et al.*:

Applicant respectfully disagrees with the rejection.

Similar to Applicant's independent claim 1, Applicant's claim 3 claims a solid-state imaging device that has an output portion connected to an output end of a horizontal transfer register. The output portion has a gate structure including an oxide film and a nitride film. The solid-state imaging device also has upper layer films allowing ultraviolet rays having a wavelength of 400 nm or less to pass therethrough, and an organic film formed in such a manner as to cover a region of the gate structure of the output portion.

Since claim 3 claims its gate structure in an output portion, claim 3 is allowable over *Higashide* in view of *Lin* for at least the same reasons that claim 1 is allowable. Further, neither *Higashide* nor *Lin* discloses nor suggests an organic layer. *Haga et al.* discloses an organic layer, however *Haga et al.* also fails to teach Applicant's claimed structure having a gate structure located in an output portion.

Therefore, *Higashide* in view of *Lin* and further in view of *Haga et al.* still fails to disclose or suggest Applicant's claim 3.

Applicant respectfully submits that the rejection has been overcome and requests that it be withdrawn.

CONCLUSION

In view of the foregoing, it is submitted that claims 1-3 are patentable. It is therefore submitted that the application is in condition for allowance. Notice to that effect is respectfully requested.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Please replace the paragraph beginning at page 3, line 17, with the following replacement paragraph:

--However, for a CCD solid-state imaging device of a type of giving a sensitivity in an ultraviolet region having a wavelength [frequency] of, for example, 400 nm or less, since the device uses a protective film allowing ultraviolet rays to pass therethrough, the ultraviolet rays enter gates not shielded by a metal film, for example, an output gate and a reset gate. When ultraviolet rays enter an output gate and a reset gate, a threshold voltage V_{th} is shifted, to cause a problem that the transfer and reset of electric charges cannot be performed.--

Please replace the paragraph beginning at page 4, line 13, with the following replacement paragraph:

--To achieve the above object, according to an aspect of the present invention, there is provided a solid-state imaging device having a gate structure including an oxide film and a nitride film, including: upper layer films allowing ultraviolet rays having a wavelength [frequency] of 400 nm or less to pass therethrough; and a metal made shield film formed in such a manner as to cover a region of the gate structure including an oxide film and a nitride film, excluding a light receiving portion and a transfer portion, of the solid-state imaging device.--

Please replace the paragraph beginning at page 4, line 23, with the following replacement paragraph:

--According to another aspect of the present invention, there is provided a solid-state imaging device having a gate structure including an oxide film and a nitride film, including: upper layer films allowing ultraviolet rays having a wavelength [frequency] of 400 nm or less to pass therethrough; and an organic film capable of absorbing the ultraviolet rays, the organic film being formed in such a manner as to cover a region of the gate structure including an oxide film and a nitride film, excluding a light receiving portion and a transfer portion, of the solid-state imaging device.--

Please replace the paragraph beginning at page 5, line 10, with the following replacement paragraph:

--With these configurations, since the metal made shield film or the organic film capable of absorbing ultraviolet rays is provided to cover an MONOS gate structure region, excluding a light receiving portion and a transfer portion, of the solid-state imaging device, it is possible to prevent ultraviolet rays from entering the MONOS gate structure excluding the light receiving portion and transfer portion, for example, an output gate and a reset gate. As a result, it is possible to prevent [preventing] the deterioration of the solid-state imaging device and hence to improve the reliability of the solid-state imaging device.--

Please replace the paragraph beginning at page 11, line 1, with the following replacement paragraph:

--A second solid-state imaging device 2 as the second embodiment shown in FIG. 2 has the same basic configuration as that of the first solid-state imaging device 1 shown in FIGS. 1A and 1B, except that an organic film for absorbing ultraviolet rays is used in place of the metal made shield film. The organic film may be made from a colored resist. Preferably, the colored resist has an ability of absorbing 95% or more of ultraviolet rays having a wavelength [frequency] of 400 nm or less. Further, the absorbance of the organic film may be determined based on a combination of a material of an organic film and a film thickness.--

Please replace the Abstract of the Disclosure with the following replacement Abstract of the Disclosure:

--A solid-state imaging device having a gate structure including an oxide film and a nitride film includes upper layer films (for example, a planarization film, an insulating film, and a protective film) allowing ultraviolet rays having a wavelength [frequency] of 400 nm or less to pass therethrough; and a metal made shield film or an organic film capable of absorbing the ultraviolet rays formed in such a manner as to cover a region of the gate structure (for example, an output gate and a reset gate), excluding a light receiving portion and a transfer portion, of the solid-state imaging device. With this configuration, it is possible to prevent the shift of a threshold voltage V_{th} , and hence to enhance the reliability of the transfer or reset of electric charges.--

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited as First Class Mail in an envelope addressed to Asst. Commissioner for Patents, Washington, D.C. 20231 on July 9, 2002.

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